

PACIFIC GAS AND ELECTRIC COMPANY  
STATION CONSTRUCTION DEPARTMENT  
DIABLO CANYON PROJECT

Unit 1

TEST PROCEDURE NO. 44.2

SPECIAL LOW POWER TEST PROGRAM  
CVCS CHARGING AND LETDOWN COOLDOWN CAPABILITY

**FOR INFORMATION  
ONLY**

Prepared by/Date Brian LoConte 5/15/80 Startup Engineer

Approved by/Date \_\_\_\_\_ Lead Startup Engineer

\_\_\_\_\_ Plant Superintendent

Performed by/Date \_\_\_\_\_ Startup Engineer

\_\_\_\_\_ Plant Superintendent

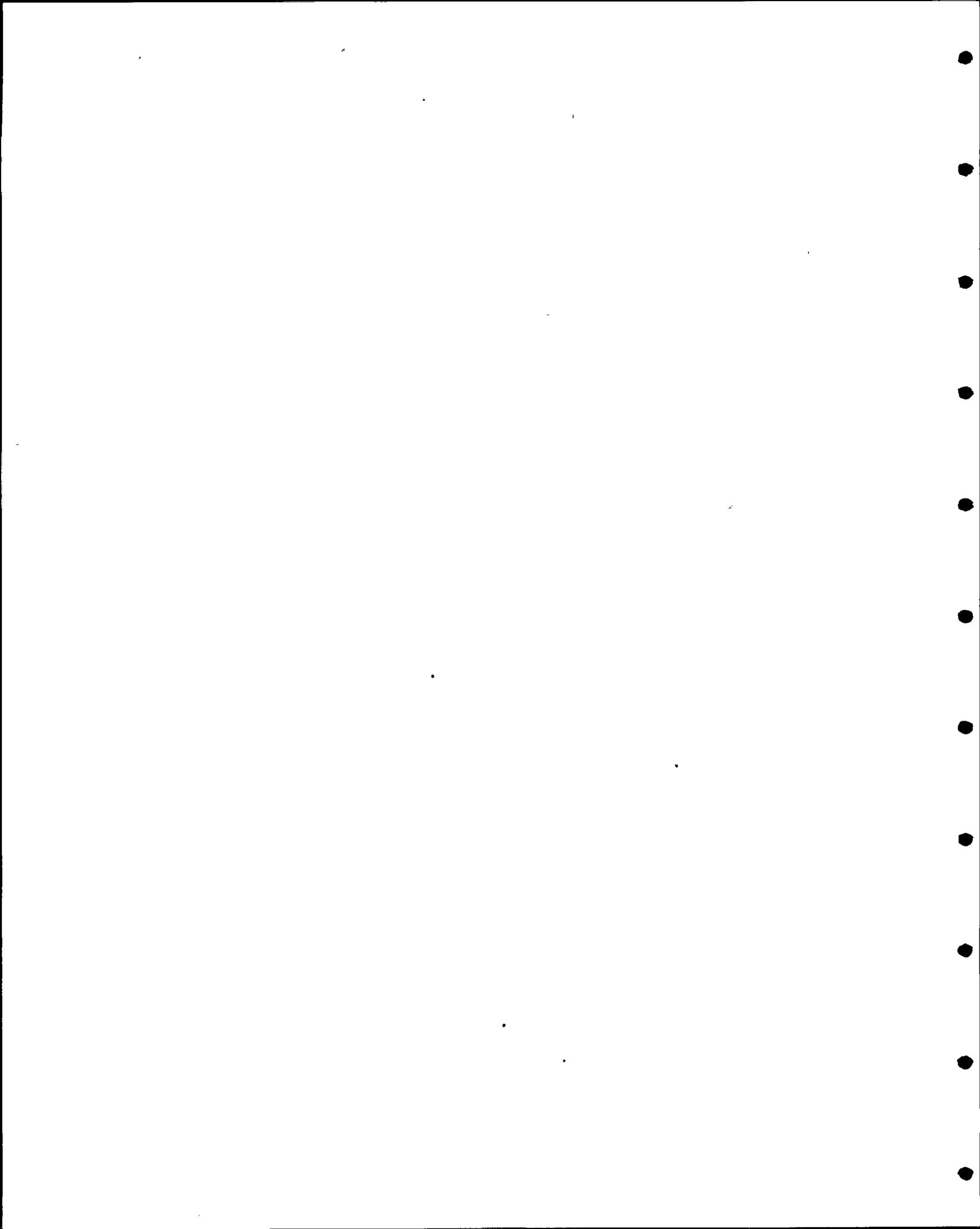
Approved by/Date \_\_\_\_\_ Lead Startup Engineer

Accepted for  
Operation by/Date \_\_\_\_\_ Plant Superintendent

Distribution: Power Plant Superintendent (4) Resident Civil Engineer (1)  
 Project Engineer (2) Resident Electrical Engineer (3)  
 Onsite Q.A. (1) Resident Mechanical Engineer (1)  
 Westinghouse (site manager) (2) Coordinating Q.C. Engineer (Orig)

Startup Files: Red \_\_\_\_\_  
 Green \_\_\_\_\_

**CLASS - 1**



# FOR INFORMATION ONLY

PACIFIC GAS AND ELECTRIC CORPORATION  
STATION CONSTRUCTION DEPARTMENT  
DIABLO CANYON PROJECT

## UNIT 1

### TEST PROCEDURE NO. 44.2

#### SPECIAL TEST - CVCS CHARGING AND LETDOWN COOLDOWN CAPABILITY

#### 1.0 TEST PURPOSE

To determine the cooling capability of the charging and letdown system with the secondary plant isolated.

#### 2.0 TEST DESCRIPTION

Reactor conditions of approximately 540°F and 2235 psig will initially be established. Three of the four reactor coolant pumps will be tripped and the steam dump to the main condenser will be used to maintain no-load steam generator pressure (~1005 psig). The steam generators will then be isolated. The cooldown capability of the CVCS charging and letdown system will be determined from the hot and cold leg temperatures of the active loop at maximum flow (120 gpm) and minimum flow (45 gpm).

In addition, core exit thermocouples will be monitored to assess core flow distribution.

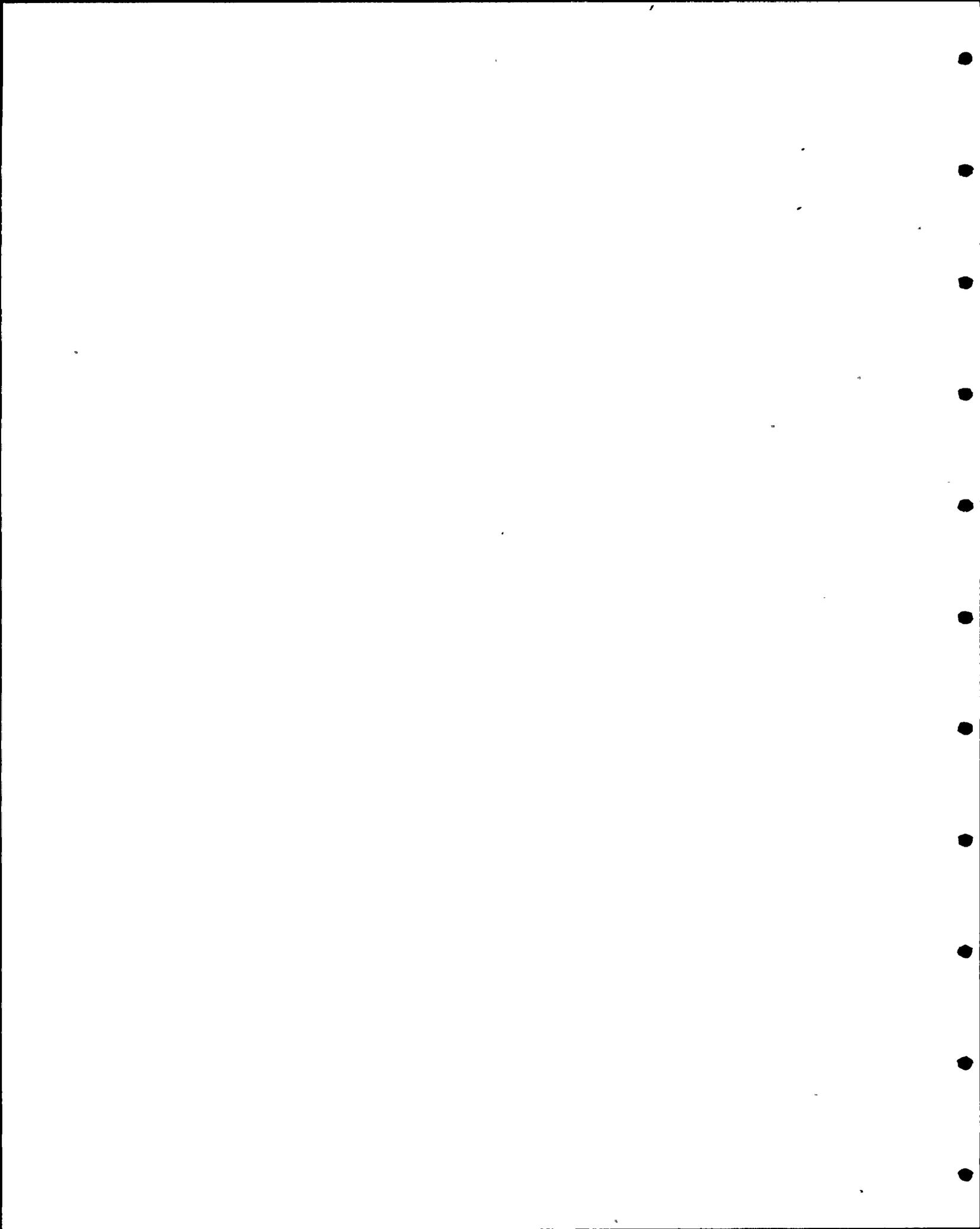
#### 3.0 REFERENCES

##### 3.1 Piping Schematics:

- |                                       |          |
|---------------------------------------|----------|
| a) Turbine Steam Supply System        | 102004-8 |
| b) Reactor Coolant System             | 102007-7 |
| c) Chemical and Volume Control System | 102008-8 |

##### 3.2 Instrument Schematics:

- |                                     |          |
|-------------------------------------|----------|
| a) Flow Instrument Systems          | 102032-8 |
| b) Pressure Instrument Systems      | 102034-8 |
| c) Temperature Instrument Systems   | 102035-8 |
| d) Multivariable Instrument Systems | 102036-7 |



TEST PROCEDURE NO. 442  
**FOR INFORMATION ONLY**

3.3 Startup Test Procedure 40.0, "Program Outline Initial Core Loading, Initial Criticality, Zero Power Physics and Power Escalation."

3.4 Diablo Canyon Nuclear Design Report

DC 663277-17-2

3.5 Diablo Canyon Unit 1 Plant Technical Specifications

3.6 Diablo Canyon Plant Manual

3.7 Diablo Canyon FSAR

4.0 PREREQUISITES

4.1 The General Construction (G.C.) and Nuclear Plant Operations (NPO) Personnel observing/participating in this test procedure have been briefed on the objectives, general procedure steps, and precautions of this test procedure.

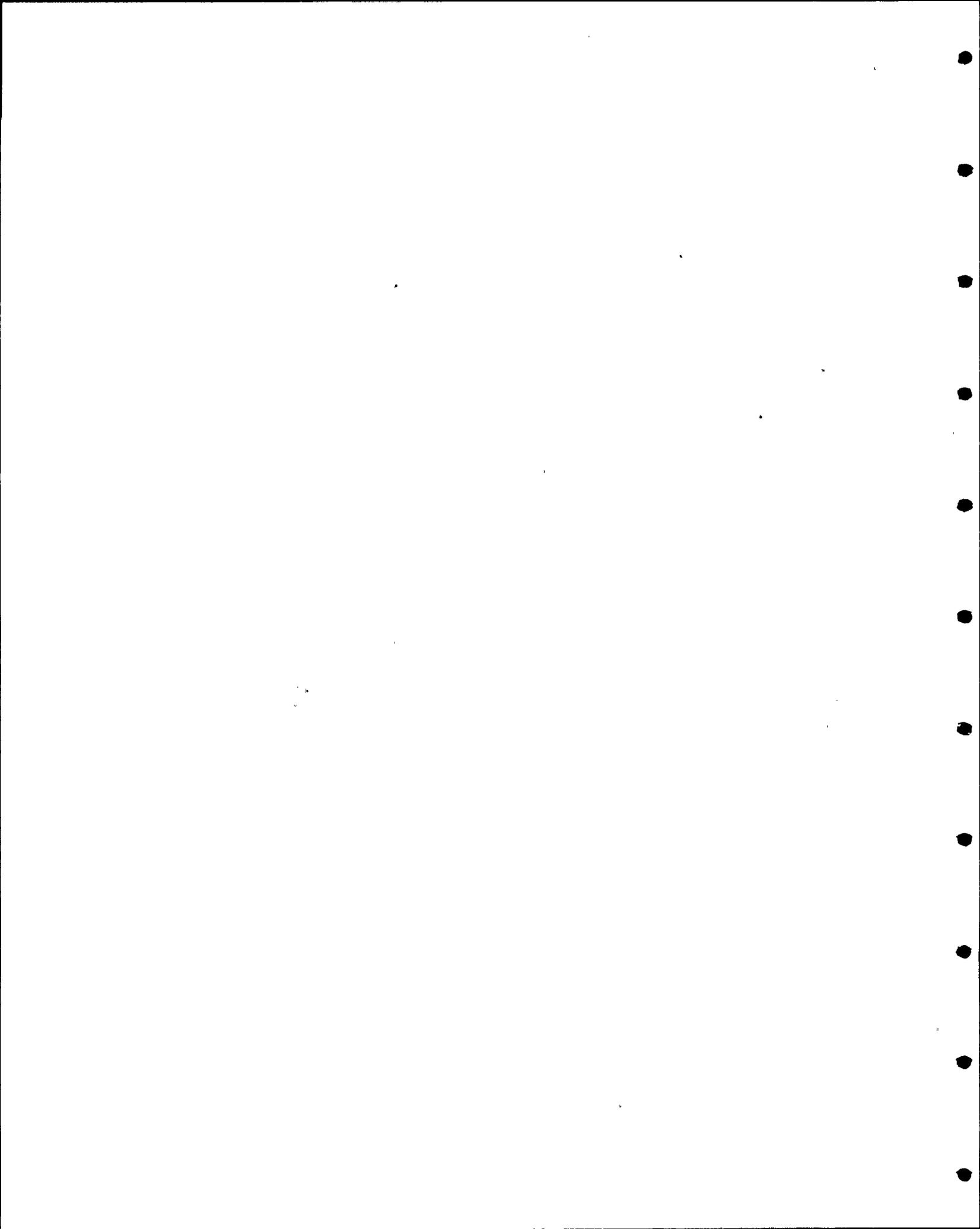
4.2 The appropriate step of Startup Test Procedure 40.0, "Program Outline Initial Core Loading, Initial Criticality, Zero Power Physics and Power Escalation," has been reached.

4.3 Safety Injection signals blocked as detailed in Appendix B.

4.4 Visicorder(s) set up to monitor the following data:

- NOTE:
1. Label each trace with date, time, recorder speed, parameter measured, scaling units, and input signal source.
  2. For each special test instrument and permanent plant instrument used in this test procedure, supply the data asked for on the attached TEST INSTRUMENT LIST and verify calibration.

a)	Charging Flow	FM 128	Output	_____
b)	Letdown Flow	FD/134	Output	_____
c)	Hot Leg Temperature			
	Loop 1	TM413A	Output	_____
	Loop 2	TM423A	Output	_____
	Loop 3	TM433A	Output	_____
	Loop 4	TM443A	Output	_____
d)	Cold Leg Temperature			
	Loop 1	TM4138	Output	_____
	Loop 2	TM4238	Output	_____
	Loop 3	TM4338	Output	_____
	Loop 4	TM4438	Output	_____



# FOR INFORMATION

ONLY  
TM 127      Outlet  
                  Outlet

- e) Regenerative heat exchanger outlet temperature
  - Charging Side
  - Letdown Side

\_\_\_\_\_  
\_\_\_\_\_

4.5 Steam generator chemistry is such that blowdown may be terminated when the steam generators are isolated.

\_\_\_\_\_

4.6 The auxiliary boiler is in service and available to supply steam where required when the main steam isolation valves are closed.

\_\_\_\_\_

4.7 At least one of the source range channels set up to NR-45 so that any changes in the core flux level can be monitored.

\_\_\_\_\_

## 5.0 INITIAL CONDITIONS

5.1 The reactor is shutdown and borated to ensure adequate shutdown margin..

5.1.1 NPO has performed a shutdown margin calculation (STP R-19).

\_\_\_\_\_

5.1.2 Record the boron concentration used in the above calculation (this should be the most recent RCS boron concentration).

\_\_\_\_\_ ppm

5.1.3 Verify that the concentration recorded above is greater than 783 ppm.

\_\_\_\_\_

5.2 All four reactor coolant pumps are in operation.

\_\_\_\_\_

5.3 Steam generator level being maintained at approximately 33% (narrow range) with the Auxiliary Feedwater System motor driven pumps.

\_\_\_\_\_

5.4 Reactor coolant system pressure and level under automatic control at approximately 2235 psig and 22% respectively.

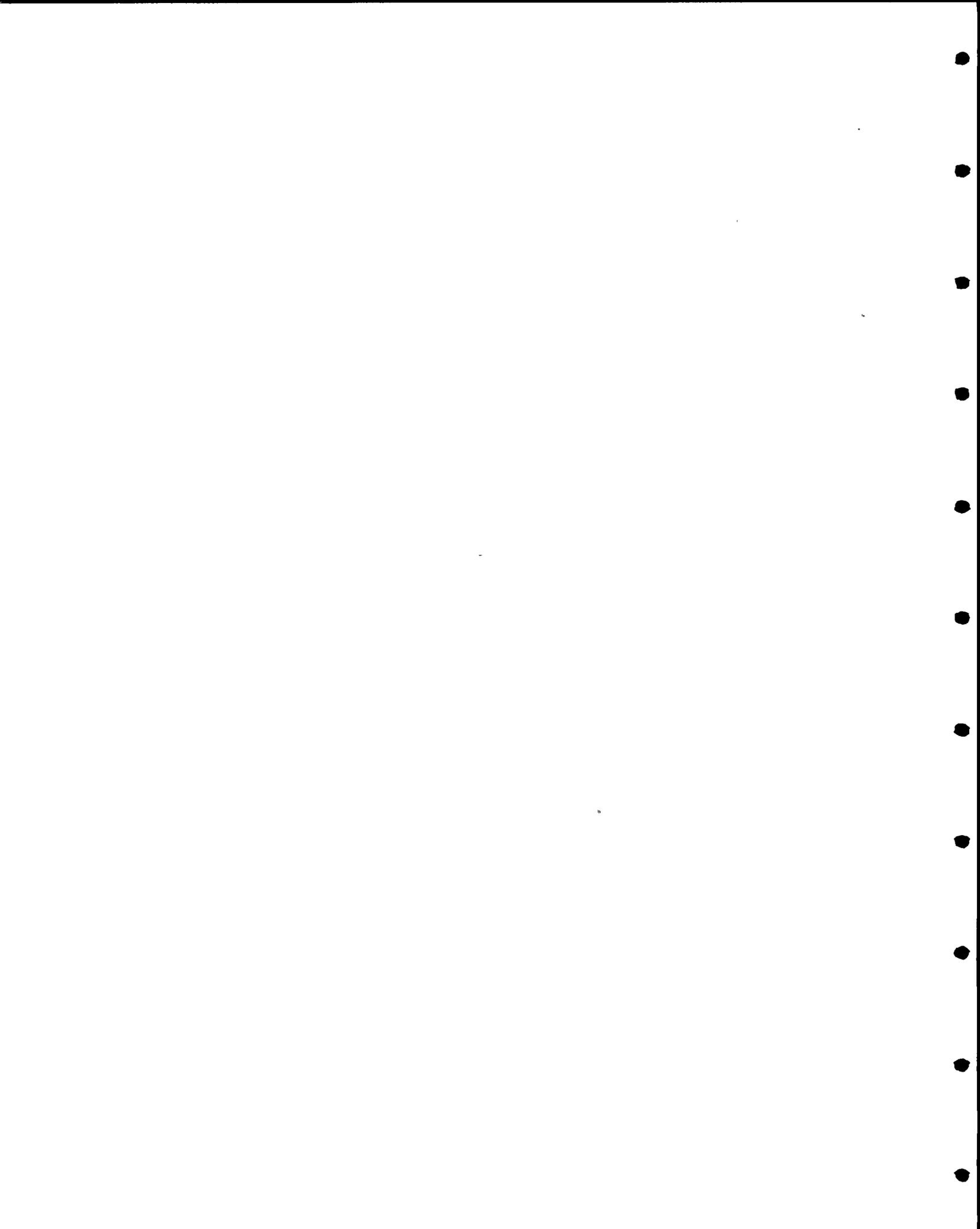
\_\_\_\_\_

5.5 Reactor coolant system temperature being controlled at approximately 540°F by steam dump to the condenser under automatic pressure control. (Steam generator pressure at approximately 948 psig.)

\_\_\_\_\_

5.6 Letdown at a rate of 120 gpm, and charging at a rate to maintain pressurizer level.

\_\_\_\_\_



# FOR INFORMATION

# ONLY

5.7 The following parameters being monitored on the P-250 trend printer:

a) Wide Range Temperature

	Loop 1	Loop 2	Loop 3	Loop 4
T <sub>hot</sub>	T0419A _____	T0439A _____	T0459A _____	T0479A _____
T <sub>cold</sub>	T0406A _____	T0426A _____	T0446A _____	T0466A _____

b) Pressurizer Pressure (Only one of the channels selected for pressure control at control console selector switch need be monitored).

Channel 1	Channel 2	Channel 3	Channel 4
P0480A _____	P0481A _____	P0412A _____	P0483A _____

c) Pressurizer Level (Only the channel selected for level control at control console selector switch need be monitored).

Channel 1	Channel 2	Channel 3
L0480A _____	L0481A _____	L0482A _____

d) Steam Generator Level (Narrow Range)

S/G 1-1	S/G 1-2	S/G 1-3	S/G 1-4
L0400A _____	L0420A _____	L0440A _____	L0460A _____

e) Steam Generator Pressure

S/G 1-1	S/G 1-2	S/G 1-3	S/G 1-4
P0400A _____	P0420A _____	P0440A _____	P0460A _____

f) Reactor Coolant Seal Water Inlet

RCP 1-1	RCP 1-2	RCP 1-3	RCP 1-4
F0435D _____	F0436D _____	F0437D _____	F0438D _____

g) Reactor Coolant Seal 1 Leakoff (wide range)

RCP 1-1	RCP 1-2	RCP 1-3	RCP 1-4
F0406D _____	F0407D _____	F0408D _____	F0409D _____

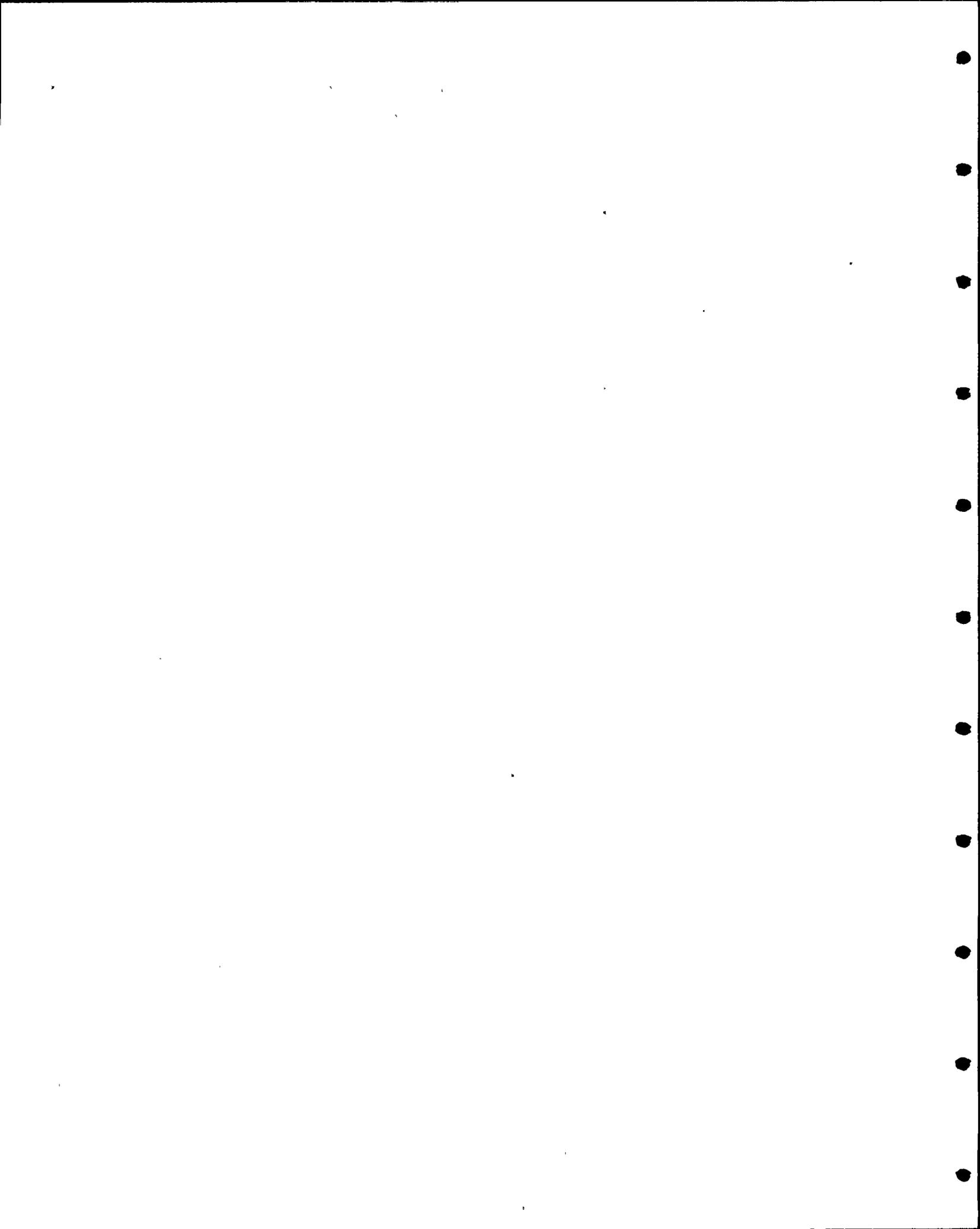
h) Volume control tank outlet temperature

T0140A \_\_\_\_\_

5.8 Place the following atmospheric steam dump control valves in "manual" mode.

S/G 1-1	S/G 1-2	S/G 1-3	S/G 1-4
PCV 19 _____	PCV 20 _____	PCV 21 _____	PCV 22 _____

5.9 Arrange to have incore thermocouple data printed upon request.



# FOR INFORMATION ONLY

## 6.0 TEST INSTRUCTIONS

**CAUTION:** The system configuration for this test is an abnormal mode. The participants of this test procedure should therefore be alert to any unanticipated events that may occur during the course of this test, and react in accordance with existing emergency and normal operating procedures. Appendix A lists the Technical Specifications exceptions for this test.

**CAUTION:** An operator initiated safety injection should be performed only for one or more of the following conditions:

- a) Reactor Coolant System Subcooling ≤ 10°F
- b) Sudden Unexplained Decrease in Pressurizer Level of or to an Indicated Level of 10%  
≤ 10%
- c) Sudden Unexplained Decrease in Any S/G Level to or < 76% Wide Range  
≤ 0% Narrow Range
- d) Unexplained Pressurizer Pressure Drop Of ≥ 200 psi

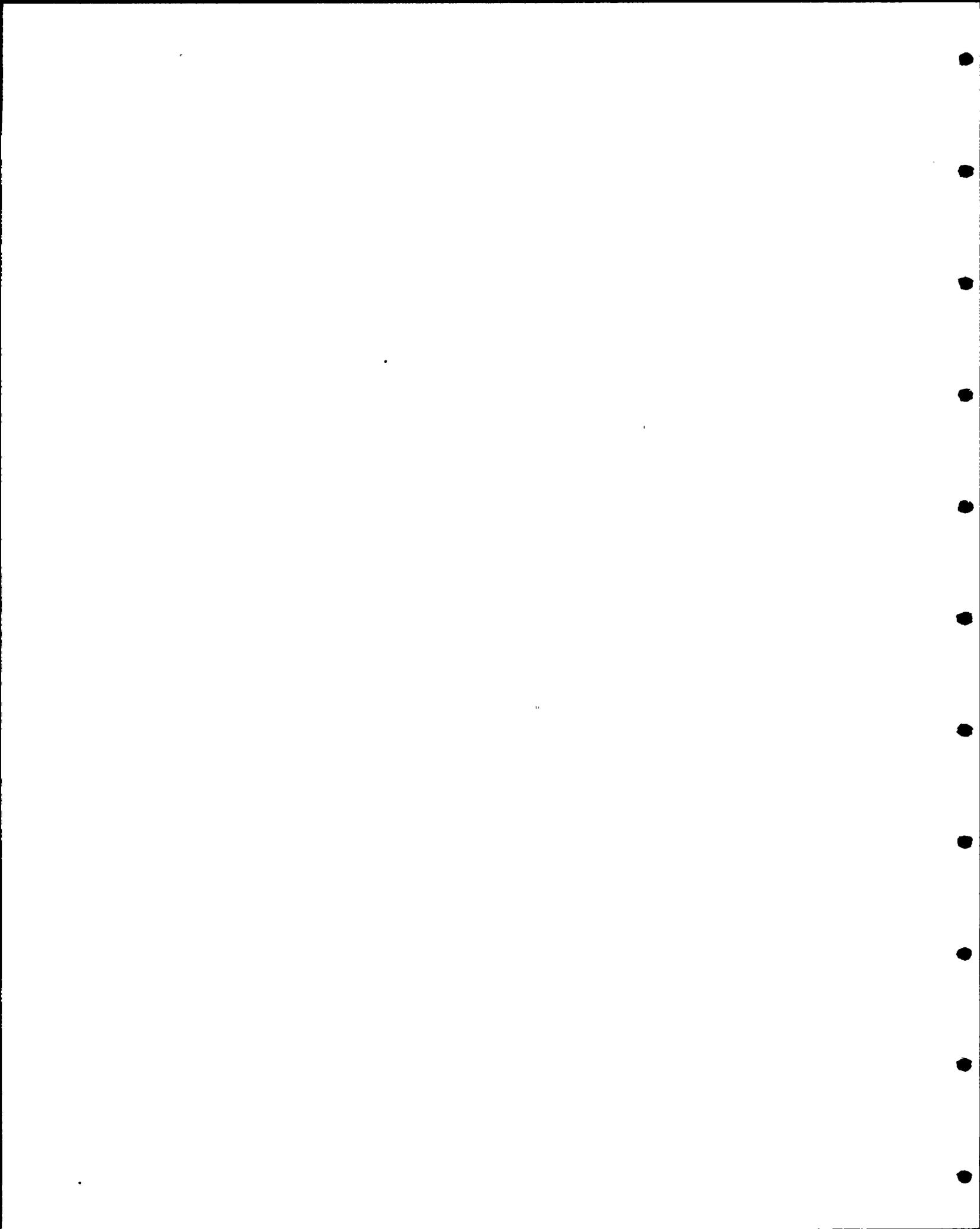
**NOTE:**

1. The boron concentration in the pressurizer should not be less than the concentration in the reactor coolant loops by more than 50 ppm. Use pressurizer spray to equalize concentration.
2. Charging flow to the RCS must be at the same boron concentration as that in the RCS.
3. A minimum seal injection flow of 6 gpm to each RCP must be maintained throughout this test.
4. The source range channels should be monitored closely during the course of this test.
5. Once the steam generators are isolated, steam generator pressures should not exceed 1025 psig.

6.1 Start visicorder traces and computer trend printout with trending of 5 minutes. \_\_\_\_\_

6.2 Shutdown reactor coolant pumps 1-1, 1-3 and 1-4.

RCP 1-1 \_\_\_\_\_  
 RCP 1-3 \_\_\_\_\_  
 RCP 1-4 \_\_\_\_\_



# FOR INFORMATION

6.3 Isolate all four steam generators by closing the following valves:

S/G 1-1

S/G 1-2

S/G 1-3

S/G 1-4

**ONLY**

a) Main steam isolation valve (MSIV)

FCV 41 \_\_\_\_\_ FCV 42 \_\_\_\_\_ FCV 43 \_\_\_\_\_ FCV 44 \_\_\_\_\_

b) MSIV bypass valve

FCV 25 \_\_\_\_\_ FCV 24 \_\_\_\_\_ FCV 23 \_\_\_\_\_ FCV 22 \_\_\_\_\_

c) Main feedwater supply valve

FCV 510 \_\_\_\_\_ FCV 520 \_\_\_\_\_ FCV 530 \_\_\_\_\_ FCV 540 \_\_\_\_\_

d) Auxiliary Feedwater Supply Valves

LCV 106 \_\_\_\_\_ LCV 107 \_\_\_\_\_ LCV 108 \_\_\_\_\_ LCV 109 \_\_\_\_\_  
 LCV 110 \_\_\_\_\_ LCV 111 \_\_\_\_\_ LCV 115 \_\_\_\_\_ LCV 113 \_\_\_\_\_

e) Blowdown isolation valve

FCV 760 \_\_\_\_\_ FCV 761 \_\_\_\_\_ FCV 762 \_\_\_\_\_ FCV 763 \_\_\_\_\_

f) Auxiliary feedwater steam supply valve FCV 95. \_\_\_\_\_

120 gpm

45 gpm

6.4 Verify charging and letdown is at the desired flow (record flows on Data Sheet #1). Flow will be maintained for approximately 30 minutes.

\_\_\_\_\_

\_\_\_\_\_

6.5 After approximately 15 minutes at this flow rate, request that incore thermocouple data be printed and attach to test procedure

\_\_\_\_\_

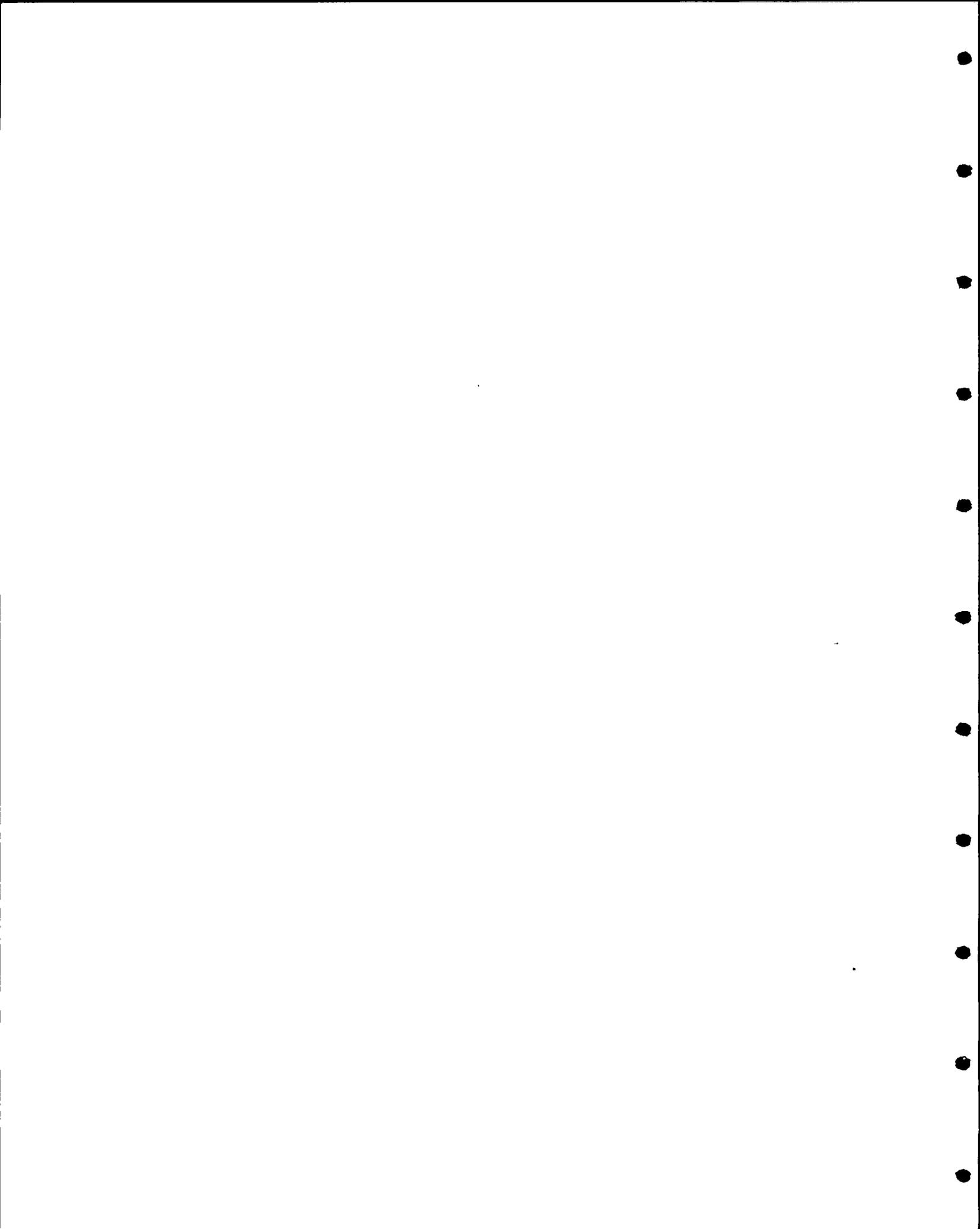
\_\_\_\_\_

6.6 Toward the end of the 30 minute period, instruct the NPO personnel to perform a shutdown margin calculation (STP R-19), and record the boron concentration used in the calculation.

\_\_\_\_\_ ppm

\_\_\_\_\_ ppm

NOTE: The boron concentration in the RCS should still be greater than 783 ppm. If not, use appropriate operating procedures to restore adequate shutdown margin.



# FOR INFORMATION

# ONLY

6.7 Repeat steps 6.4 through 6.6 for a charging and flow rate of 45 gpm.

6.8 Stop visicorder traces and trend computer printout and attach to test procedure.

6.9 Restart reactor coolant pump 1-1, 1-3, and 1-4 and reopen the main steam isolation valve, the auxiliary feedwater supply valve, and the blowdown isolation valve for each steam generator. Note: The order of restarting the reactor coolant pumps and opening of the valves will depend on RCS conditions and will be done in accordance with standard operating procedures.

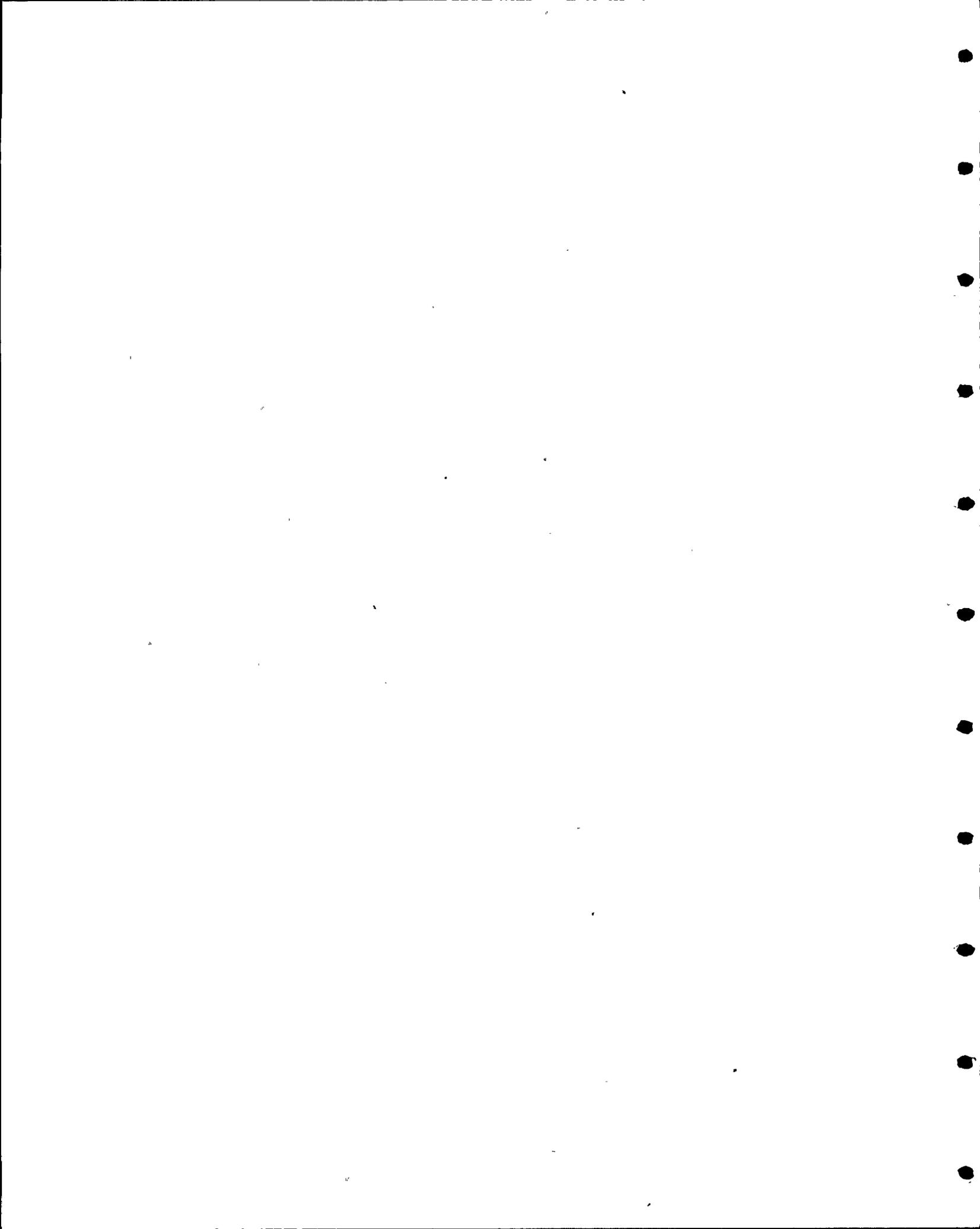
6.10 Remove the safety injection signal blocks established in Appendix B unless required for the next step of Startup Procedure 40.0, "Program Outline Initial Core Loading, Initial Criticality, Zero Power Physics and Power Escalation." If the blocks are not removed, enter N/A.

6.11 Using the attached visicorder traces and/or trend computer printout, complete Data Sheet #1.

6.12 Align systems as required for the next step of Startup Procedure 40.0, "Program Outline Initial Core Loading, Initial Criticality, Zero Power Physics and Power Escalation".

## 7.0 ACCEPTANCE CRITERIA

7.1 The Acceptance Criteria of this test procedure shall be considered met when all steps of this procedure have been completed.



FIELD DATA SHEET #1  
Pacific Gas and Electric Co.

Form 200

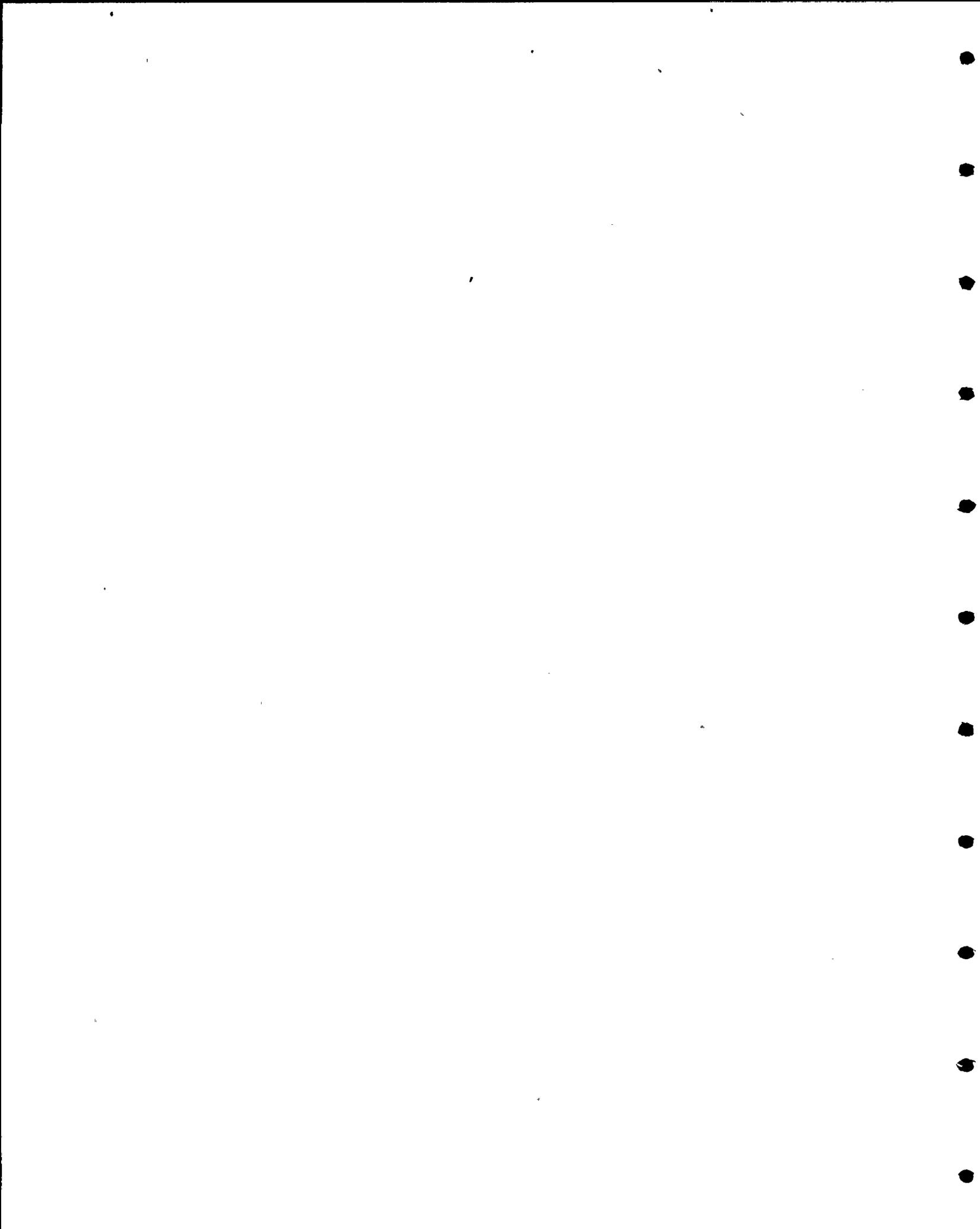
Station Diablo Canyon Unit 1

CVCS Charging and Letdown Cooldown Capability

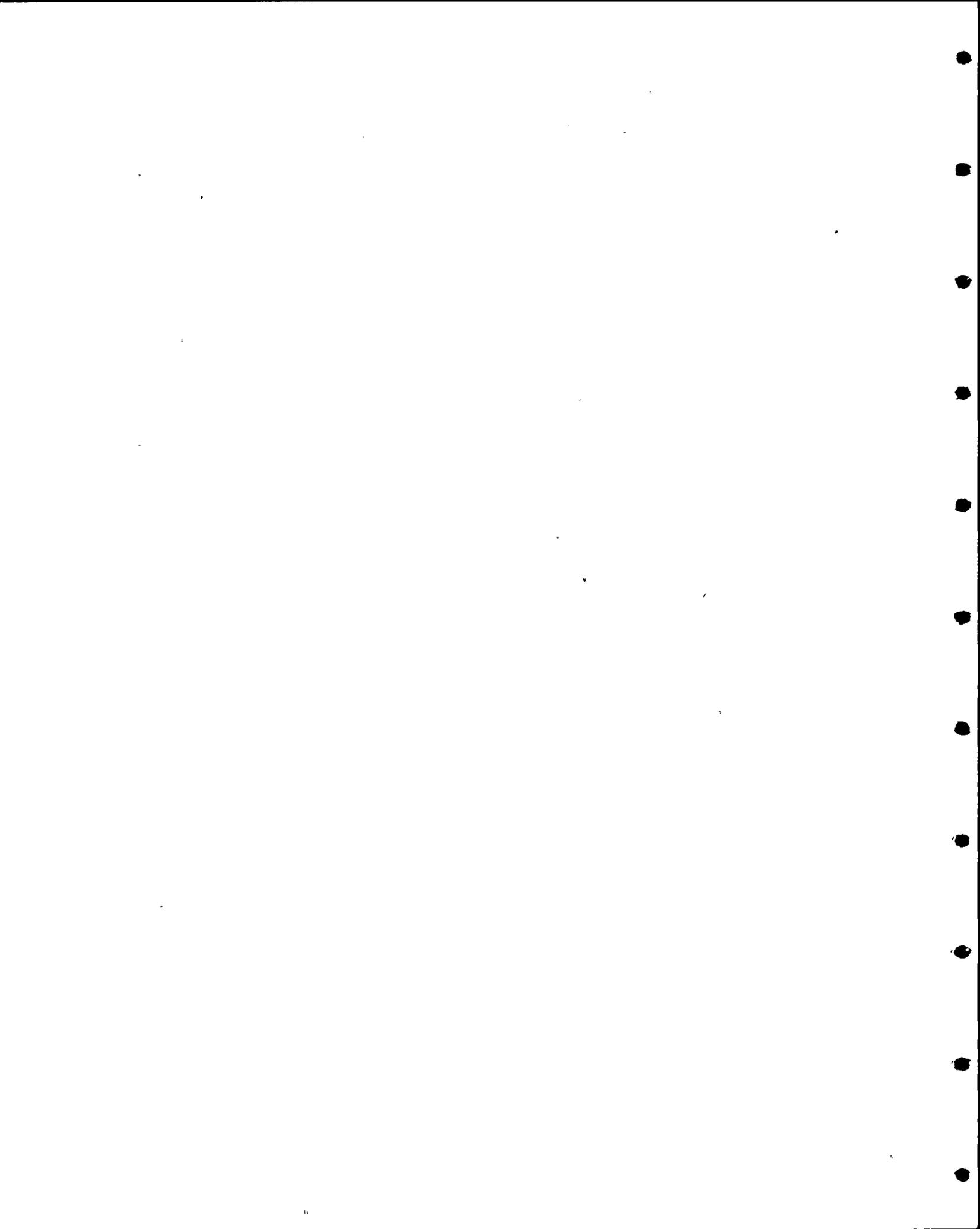
Year \_\_\_\_\_

1	2	3	4	5	6	7	8	9	10			11			16	17	18	19	20
									Initial			Final							
Date	Time	Charging & Letdown Target Flow Rate (GPM)		Charging Flow Rate (GPM)	Letdown Flow Rate (GPM)	T Hot Leg (°F)	T Cold Leg (°F)	T Avg (°F)	T Hot Leg (°F)	T Cold Leg (°F)	T Avg (°F)	$\Delta T_{Avg}$ (°F)	$\Delta T_{Avg}/.5$ (°F/11r)						
				120															
				120															
				45															
				45															
<b>FOR INFORMATION ONLY</b>																			

Remarks: Temperature Data is from Loop 2





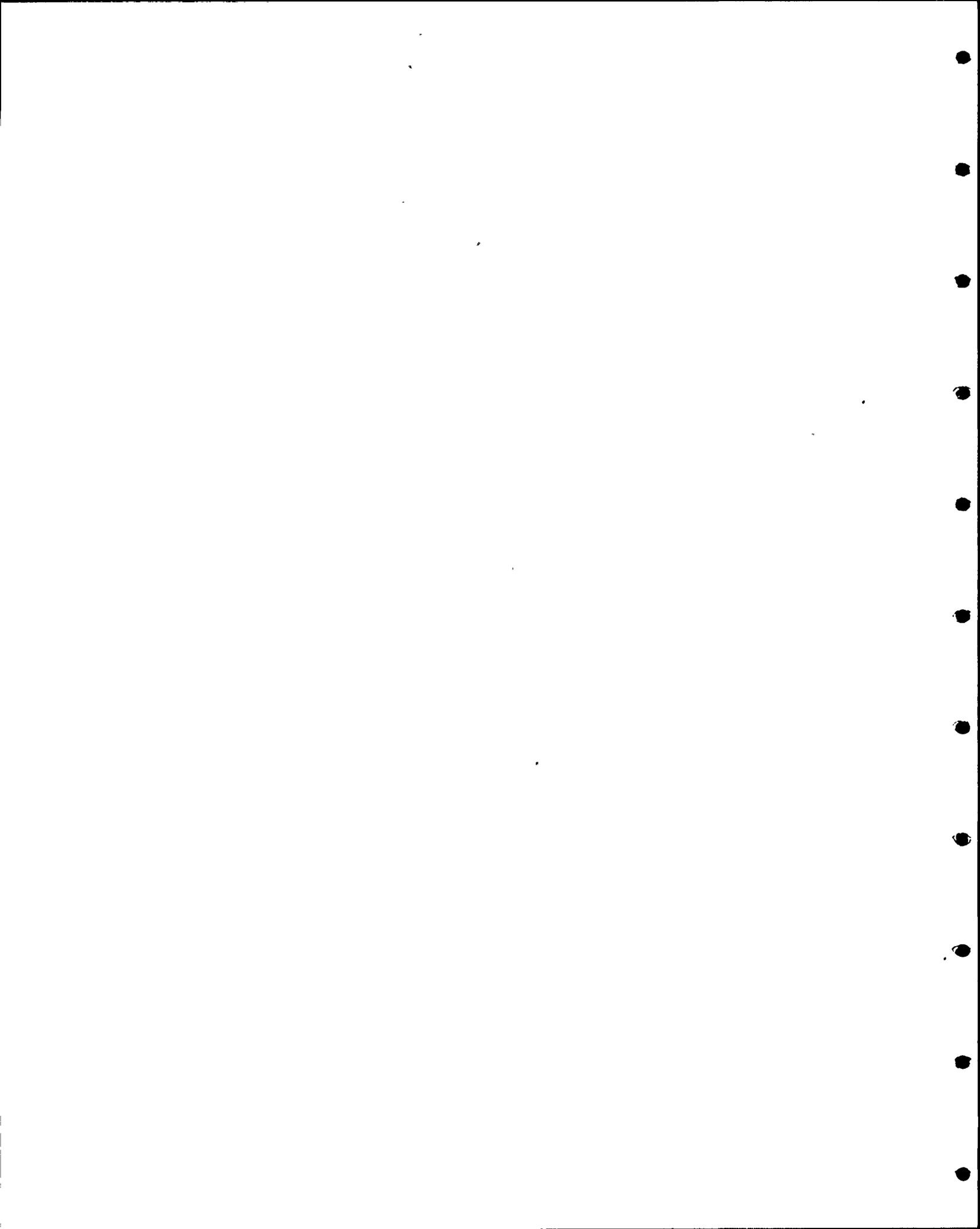


# FOR INFORMATION

## ONLY Technical Specifications Exceptions

The table below identifies those technical specification items which are temporarily bypassed or require special test exceptions to the limiting conditions for operation during the performance of this and all other special tests.

TECHNICAL SPECIFICATION	44.1					44.2	44.3
	1.1	1.2	1.3	1.4	1.5		
2.1.1 Safety Limits	X	X	X	X	X		
3.1.1.3 Moderator Temperature Coefficient						X	
3.1.1.4 Minimum Temperature for Criticality						X	
3.3.1 Various Reactor Trips							
Overtemperature $\Delta T$	X	X	X	X	X		
Overpower $\Delta T$	X	X	X	X	X		
3.3.2 Safety Injection							
All Automatic Functions	X	X	X	X	X		
3.4.1 Reactor Coolant Loops							
Normal Operation	X	X	X	X	X		
3.4.4 Pressurizer		X	X				X
3.7.1.2 Auxiliary Feedwater Sys.					X		X
3.8.1.1 A. C. Sources					X		
3.8.2.1 Onsite Power							
A. C. Distribution					X		X
3.8.2.3 Onsite Power							
D. C. Distribution					X		X



# FOR INFORMATION ONLY

APPENDIX B

## ENGINEERED SAFETY FEATURES AND REACTOR PROTECTION MODIFICATIONS

During the performance of these tests, modifications will be made to the Engineered Safety Features and the Reactor Protection systems. The systems will operate as specified below.

- A. All automatic Safety Injection (SI) functions, except reactor trip, will be blocked. A Safety Injection actuation signal will result in the following:
  - 1. Reactor Trip
  - 2. Control Room Trip Indication and Alarms
  
- B. Safety Injection actuation can be initiated by manual switch operation.
  
- C. Overtemperature  $\Delta T$  and Overpower  $\Delta T$  Reactor Trip signals will be blocked.

The specific method to implement the above modification is presently being formulated..

